A STAND-REPLACEMENT PRESCRIBED BURN IN SAND PINE SCRUB

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ABSTRACT

This paper describes fire characteristics and the immediate effects of a prescribed, high-intensity burn on a 12.2 hectare portion of a stand of Ocala sand pine scrub. The fire team on the Seminole District, Ocala National Forest used the BEHAVE fire model to predict the conditions needed to accomplish a stand-replacement burn. Suitable conditions arose on May 11, 1993 with temperature 26° Celsius, relative humidity 50%, wind 3 kilometers per hour, and fuel moisture (1-hour fuel) 7%. The area was burned by establishing a 40 meter blackline with backfires and then setting a headfire. The prolific smoke produced was not a problem due to selection of proper atmospheric conditions. Fire intensity was variable and affected by position and fuel loading, but on average was twice as high in the interior compared to the edge. The crowns of nearly all sand pine were severely scorched, and all trees subsequently died. Twenty-seven percent of the preburn snags were felled by the fire. Fire eliminated the shrub layer and reduced the litter layer thickness by 50%. The amount of bare ground was 0.1% in control plots and 17% in the burned area. Following the burn, light increased from 6 to 17% at ground level but only from 16 to 22% at breast height, because most needles remained on the overstory sand pine.

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INTRODUCTION

The sand pine scrub community is a unique habitat with a suite of species that occur in no other community (Christman and Judd 1990). Mature scrub has an overstory of even-aged sand pine (*Pinus clausa* [Chapm. ex Engelm.] Vassey ex Sarg.) and a variably thick understory of sclerophyllous evergreen shrubs (Myers 1990). Typical understory species include myrtle oak (*Quercus myrtifolia*), sand live oak (*Q. geminata*), Chapman's oak (*Q. chapmanii*), turkey oak (*Q. laevis*), rusty lyonia (*Lyonia ferruginea*), rosemary (*Ceratiola ericoides*), scrub palmetto (*Sabal etonia*), and saw palmetto (*Serenoa repens*). Species richness and diversity of herbaceous plants are significantly less in mature stands compared to recently disturbed areas (Greenberg et al. 1995b). The sparse cover of herbs and grasses that do occur in mature scrub habitats typically include beak rush (*Rhynchospora megalocarpa*), milk peas (*Galactia* spp.), and broomsedge (*Andropogon* spp.). Lichens (*Cladonia* spp.) form extensive patches on the forest floor (Greenberg et al. 1995b).

Scrub dominated by the Ocala variety of sand pine (*Pinus clausa* var. *clausa* D.B. Ward) is native to the central ridge of Florida (Figure 1). It is also found on a strip of old dunes stretching from St. John's County south to the northern portion of Dade County on the east coast and from near Cedar Key south to Naples on the west coast (Small 1921, Harper 1927, Myers 1990). The largest concentration is the interior scrub, which occupies about 101,215 hectares on the Ocala National Forest (Brendemuehl 1990).

Sand pine scrub grows on deep droughty infertile sands of marine and aeolian origin. Water and wind formed these features as sea levels fluctuated during past glacial and interglacial periods (Kurz 1942, Laessle 1958, Brooks 1972). Because of washing and sorting during transport and deposition, soil parent material was nearly pure quartz sand (Laessle 1958). These processes produced soils that are almost exclusively Entisols and mostly Quartzipsamments (Myers 1990) typified by the Astatula, Lakeland, Paola, and St. Lucie soil series.

Because ground cover is sparse, Ocala sand pine scrub will not burn most of the time. Periodically, every 10 to 100 years, usually during a spring drought, high wind and temperature results in a catastrophic fire. Such fires kill the sand pine overstory and burn off the understory (Myers 1990). Heat from intense fire also opens many serotinous cones in crowns of sand pine, which releases seed for establishment of the next stand. Herbaceous species, including many endemics, also respond rapidly to the disturbance by invading, resprouting, or germinating from the soil seed bank (Johnson 1982, Hartnett and Richardson 1989).

Without high-intensity disturbance, the sand pine scrub would succeed to xeric oak hammock (Laessle 1958, Veno 1976) and lose many plant and animal species requiring young, open scrub sites (Greenberg et al. 1994, 1995a, 1995b). Most of the sand pine scrub on the Ocala National Forest is managed for pulpwood production by clear-cutting, followed by site preparation and direct seeding of sand pine. Recent research indicates only minor differences in vegetation recov-

Table 1. Preburn shrub cover and fire intensity for prescribed burn of mature Ocala sand pine scrub.

Plot	Location	Shrub cover (%)	Mean intensity
1	Edge	79	1.7
2	Interior	74	4.3
3	Edge	92	1.3
4	Interior	60	1.5
5	Edge	82	1.3
6	Interior	80	3.9

RESULTS AND DISCUSSION

The burn was a successful operation. Although it produced a smoke column visible up to 25 kilometers away, the smoke rose quickly and dispersed rapidly creating no management problems (Custer and Thorsen 1996). Some minor spotting occurred during the backfire stage, but the spots were easily controlled. This study shows that high-intensity prescribed burns can be successfully implemented in the interior sand pine scrub of central Florida with careful planning.

Fire intensity varied with location and fuel loading within the burned area (Table 1). Intensity was lower in plots 1 and 3 near the edge and increased toward the northwest as the fire gained strength (Figure 3). Most of plot 5 (Figure 4) was burned with a low-intensity backfire. Greatest fire intensities were in the interior of the burned area as shown by data from plots 2 and 6 (Figure 5). Plot 4 was also in the interior, but did not burn as intensely as expected (Figure 4). Most of plot 4 was on the middle portion of a slope where conditions were drier and the sparse woody understory covered only 60% of the plot (Table 1). This lower fuel loading resulted in the lower observed intensity. Carrington (1996) also reported high variability of fire temperature at the soil surface during the burn.

Before prescribed burning the stand had 670 ± 54 Ocala sand pines/hectare, 77 ± 16 oaks/hectare and 137 ± 30 standing snags/hectare in the overstory. Sand pine diameter ranged from 6 to 30 centimeters with an average of 17.5 ± 0.3 centimeters and a mean height of 16.8 ± 0.4 meters. The oaks had an average diameter of 6.4 ± 0.6 centimeters and a mean height of 4.2 ± 0.3 meters. The fire felled 27% of the preexisting snags and 4% of the living oaks greater than 6

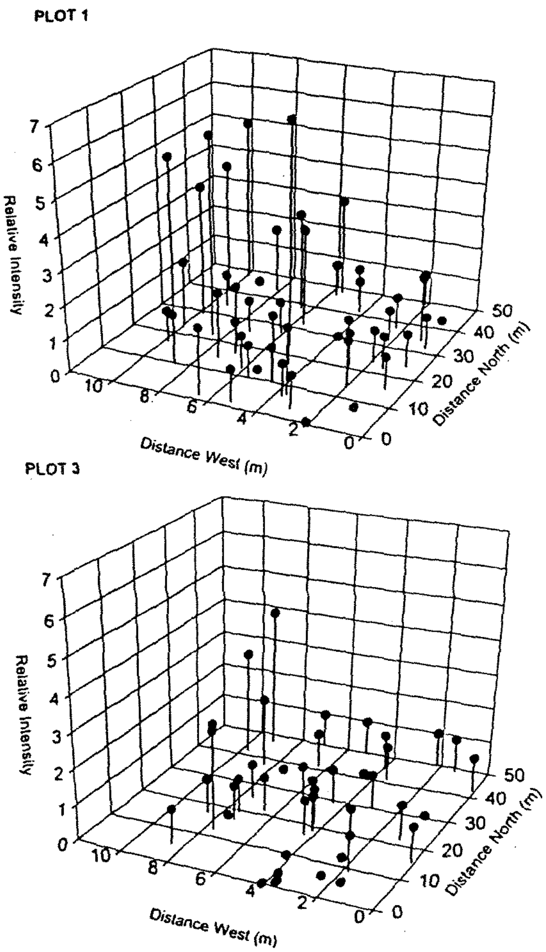

Figure 3. Relative intensity of fire across plots 1 and 3 (0 = no damage, 1 = tag tarnished, 2 = lower end of tag slightly melted, 3 = lower half of tag melted, 4 = 75% of the tag melted, 5 = tag completely melted, 6 = tag and nail melted, 7 = tag and nail burned completely off).

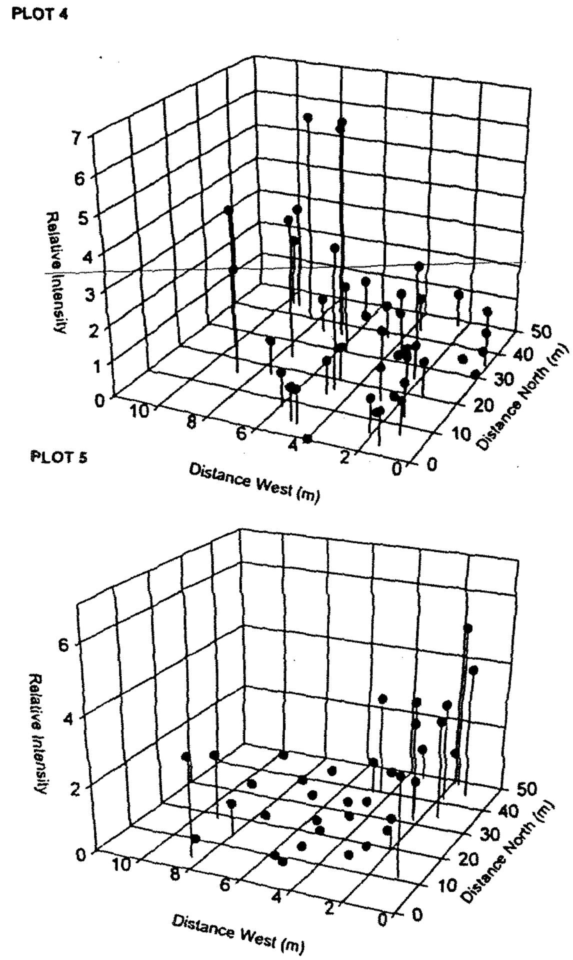

Figure 4. Relative intensity of fire across plots 4 and 5 (0 = no damage, 1 = tag tarnished, 2 = lower end of tag slightly melted, 3 = lower half of tag melted, 4 = 75% of the tag melted, 5 = tag completely melted, 6 = tag and nail melted, 7 = tag and nail burned completely off).

Death of the overstory, creation of new snags, elimination of the understory, and reduction in the litter layer significantly changed the structure of this patch of scrub. The plant community has been successfully reset to the beginning point where early successional plant and animal species requiring open scrub habitat can again thrive.

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